CLAIMS

What is claimed is:

1. A symbol timing recovery method for discrete multi-tone very high data rate digital subscriber line (DMT-VDSL) to recover the correct symbol timing of a signal containing a plurality of DMT symbols and cyclic extensions, the method comprising the steps of:

extracting from the signal a sample equal in length to the symbol;

converting the sample into the frequency domain and computing its channel frequency response;

converting the channel frequency response into the time domain, obtaining two peaks;

selecting one of the peaks and using the position and power of the peak to determine a company peak;

using the company peak and the corresponding peak to determine whether the peak is a correct peak response; and

using the peak response to calibrate the extraction position of the sample in the signal, thereby recovering the symbol timing of the signal.

2. The method of claim 1, wherein the two peaks are generated by converting two adjacent said symbols into the frequency domain.

3. The method of claim 2, wherein the powers of the two peaks are equal and the distance in between is half the length of the symbol.

4. The method of claim 1, wherein the company peak is at a position of one cyclic extension from the peak.

5. The method of claim 4, wherein the position of the company peak L_1 is:

$$L_1 = L_0 - L_{CE}, \text{ when } N/2 \geq L_0 \geq N/4; \text{ and}$$

$$L_1 = L_0 + L_{CE}, \text{ when } L_0 < N/4;$$

where L_0 is the position of the corresponding peak, L_{CE} is the position of one cyclic extension, and N is the symbol length.

6. The method of claim 5 using the condition whether the power the company peak satisfies the relation $P(L_1) \geq P(L_0)*\nu$ and the position of the peak to determine whether the peak is a correct peak response, wherein $P(L_1)$ is the power of the company peak, $P(L_0)$ is the power of the peak, and ν is a power ratio.

7. The method of claim 6, wherein the power ratio is preferably 0.1.

8. The method of claim 6, wherein the determination condition of the peak response is:

$$FLAG = \begin{cases} TRUE & \text{if } P(L_1) \geq P(L_0)*\nu \\ FALSE & otherwise \end{cases}, \text{ when } N/2 \geq L_0 \geq N/4; \text{ and}$$

$$FLAG = \begin{cases} FALSE & \text{if } P(L_1) > P(L_0)*\nu \\ TRUE & otherwise \end{cases}, \text{ when } L_0 < N/4;$$

where FLAG represents the determination condition, TRUE means that the peak is true, and FLASE means that the peak is false.

9. The method of claim 8, wherein the position of the peak response τ is:

$$\tau = \begin{cases} L_0 & \text{if } FLAG \text{ is } TRUE \\ L_0 + N_{SC} & otherwise \end{cases}$$

10. The method of claim 9, wherein the sample requires a calibration displacement $\triangle$ =N- τ .

11. The method of claim 9, wherein the sample requires a calibration displacement $\Delta = \begin{cases} N - \tau & \text{if } \tau \geq N/2 \\ N_{DMT} - \tau & otherwise \end{cases}$, where N_{DMT} is the length of the DMT symbol.

12. The method of claim 11, wherein the DMT symbol length satisfies N_{DMT}=N+CE- β where β is the overlapped length of the DMT symbols.

13. The method of claim 1, after the step of using the peak response to calibrate the extraction position of the sample in the signal, further comprising the step of repeating all the steps before it then followed by recovering the symbol timing of the signal.